Equipment that does not use RAIM for approach integrity are required to use ground-based navaids and operational airborne avionics. The approach should be requested and approved by its published name, such as "NDB Runway 24," "VOR Runway 24." Modification of the published instrument approach name is not required for Phase II.

c. Phase III (After Name Modification). Phase III requires modification of the instrument approach procedure name to include "or GPS" in the title of the published approach procedure. Neither the aircraft traditional avionics nor the ground station navaid(s) need be operational or monitored to fly nonprecision approaches at the destination airport if RAIM is providing integrity for the approach. For systems that do not use RAIM for approach integrity the ground-based navaids and operational airborne avionics needed to provide RAIM equivalency should be installed and operational. For any required alternate airport, the ground-based and airborne navigational equipment that defines the instrument approach procedure and route to the alternate should be installed and operational. The Phase III published approach will include the underlying navaid and GPS in the title; however, the type of approach must be specifically requested and approved. For example, when electing to use GPS for the "VOR or GPS RWY 24" approach, the approach should be requested and approved as "GPS RWY 24". When electing to use the VOR for the approach, the approach should be requested and approved as "VOR RWY 24".

d. Additional criteria for all Phases. For all phases of the Approach Overlay Program, civil aircraft are not authorized to use GPS to fly any segment of any instrument approach under IFR weather conditions unless the following criteria are met:

(1) The GPS avionics used to fly any nonprecision instrument approach must be certified to TSO C129 or equivalent criteria. The installation in the aircraft should be in accordance with AC 20-138 and the provisions of the applicable Approved Flight Manual (AFM) or Flight Manual supplement should be met.

(2) The airborne navigation database should contain all waypoints for the published nonprecision approaches to be flown. The use of non-differential GPS equipment is not authorized for LOC, LDA, and SDF approaches.

(3) The approach cannot be flown unless that instrument approach is retrievable from the avionics database. Some approach procedures are not included in the database due to safety reasons or non-codability. It is the responsibility of the pilot to determine if the intended approach procedure is in the database.

(4) The GPS avionics should store all waypoints depicted in the approach to be flown, and present them in the same as the published nonprecision instrument approach procedure chart.

(5) Approaches must be flown in accordance with the FAA AFM or Flight Manual Supplement and the procedure depicted on the appropriate instrument approach chart.

(6) Any required alternate airport should have an approved instrument approach procedure, other than GPS or LORAN-C, which is anticipated to be operational at the estimated arrival time. The aircraft should have the appropriate avionics installed and operational to receive the navigational aids. The pilot is responsible for checking NOTAMs to determine the operational status of the alternate airport navigational aids.

(7) The general approval to use GPS to fly overlay instrument approaches is initially limited to the U.S. National Airspace System (NAS). GPS instrument approach operations outside the United States also should be authorized by the appropriate sovereign authority.

(8) Procedures should be established by the pilot in the event that GPS outages occur. In these situations, the pilot should rely on other approved equipment, delay departure, or discontinue IFR operations.

6. PILOT OPERATIONS.

a. Usually, flying a GPS overlay nonprecision instrument approach procedure is identical to a traditional approach. The differences include the navigational information displayed on the GPS equipment and the terminology used to describe some of the features. Flying the GPS stand alone approach is normally point to point navigation and independent of any ground based navaids. Appendix 1 contains sample charts with a brief explanation of how pilot operations are affected by the GPS approach operations. Appendix 2 contains a glossary with definitions to some of the unique terminology of GPS approaches.

(1) Straight line (TO-TO) flight from waypoint to waypoint, as sequenced in the database, does not assure compliance with the published approach procedure. Should differences between the approach chart and database arise, the published approach chart, supplemented by NOTAMs, holds precedence.

(2) Pilots should be aware that when flying a GPS overlay approach, a charted track defined by a VOR may differ slightly from the course to be flown as indicated by the GPS avionics. All magnetic tracks defined by a VOR radial are determined by the application of a VOR station variation; however, GPS operations use an algorithm to apply the current local magnetic variation. Therefore, a difference between the charted course and the GPS display may occur. Either method of navigation, VOR or GPS, should produce the same desired ground track.

b. Selecting the Approach.

(1) To begin the overlay or stand alone approach, the pilot must first select the appropriate airport, runway/approach procedure, and initial approach fix.

Note: *The actual procedures, for making these selections, may vary from one avionics manufacturer to another; therefore, the pilot must be thoroughly familiar with the avionics manufacturer specifications.*

(2) Pilots must arm (enable) approach mode prior to the IAF. This enables the equipment CDI sensitivity to increase from 5nm either side of centerline to 1 nm at the appropriate time. Where the IAF is beyond the 30 mile point, CDI sensitivity will not change until the aircraft reaches 30 miles. Where the IAF is at or inside the 30 mile point, CDI sensitivity change will occur at the time approach mode is armed. Should the pilot fail to arm approach mode prior to the IAF, the equipment will provide an aural and/or visual alarm to warn the pilot to do so. Should the pilot ignore the warning and fail to arm approach mode, the equipment will provide a 2nd and final warning at approximately 3nm from the FAF. If the pilot yet fails again to arm approach mode, the equipment will flag and GPS navigation guidance will not be provided beyond the FAF. The specific method by which the GPS equipment provides these warnings is up to the manufacturer, and is explained in the Flight Manual Supplement.

(3) The equipment will automatically present the waypoints from the initial approach fix to the missed approach holding point. An example of the selection process that a pilot should make and the automatic presentation of waypoints is shown in figure 2 which was taken from the Lake Charles, Louisiana overlay approach chart in Appendix 1. The example is for illustration purposes only.

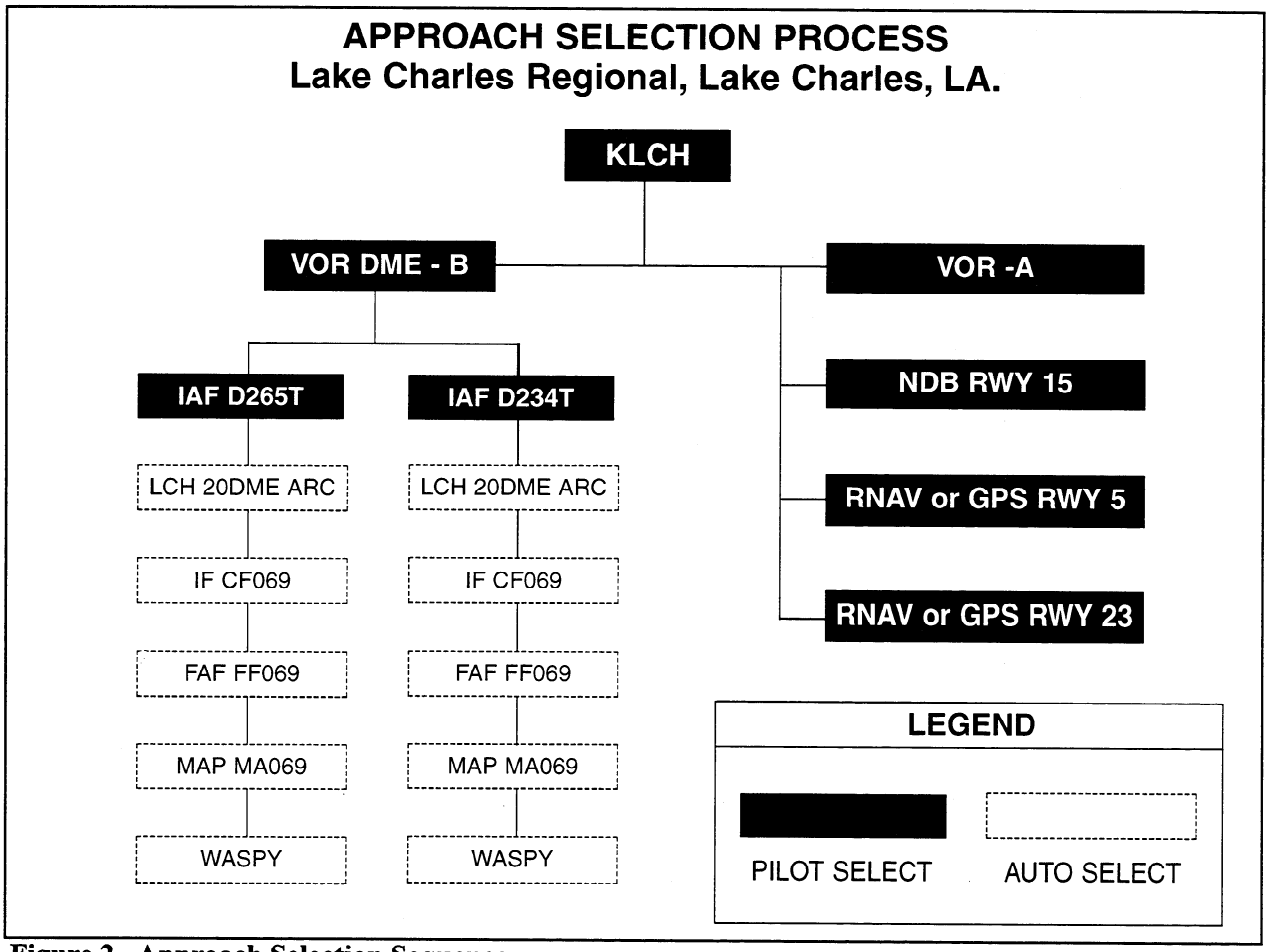


Figure 2. Approach Selection Sequence.

(4) At the MAP, the equipment will not automatically sequence to the next required waypoint; therefore, the pilot must manually sequence the GPS equipment to the next waypoint.

(5) With Radar Vectors (RV), the pilot may be required to manually select the next waypoint so that GPS is correctly using the appropriate database points and associated flight paths.

c. Initial Approach Segment. The following are some of the unique characteristics a pilot should be aware of during the initial approach segment of a nonprecision GPS approach.

(1) Arc Procedures. Arc procedures will only be encountered with overlay approaches. The method for navigating on arcs may vary with the manufacturer and pilots should use the procedures specified in the applicable AFM. It is not uncommon for an aircraft to be vectored onto the arc by ATC at a point other than the IAF for the arc. In these cases, the pilot should manually sequence the waypoints to the arc segment of the approach.

(2) Course Reversal Procedure. When performing a course reversal, such as a procedure turn or holding pattern in lieu of a procedure turn, the GPS equipment provides the capability for the pilot to change from the automatic waypoint sequencing to manual. The course reversal is flown using normal piloting techniques. The reversal and the return to automatic sequencing should be completed when established inbound on the final approach course to, but outside of the active waypoint.

Note: *The method or procedure used to switch the equipment from automatic sequencing to manual may vary between manufacturers. Pilots should use the procedure specified in the applicable AFM.*

(3) Turn Points in the Initial Segment. In some cases, a turn point is incorporated in the initial approach segment. ***Note:*** *It is important to recognize that the turn point may be either a named or coded waypoint.*

d. Intermediate Approach Segment. If an Intermediate Fix (IF) or waypoint is part of the instrument approach procedure, it is included in the database and is used the same as in a ground-based procedure.

e. Final Approach Segment. The following are some of the unique characteristics a pilot should be aware of during the final approach segment of a nonprecision GPS approach.

(1) Final Approach Fix (FAF) — Overlay Approach. In the Approach Overlay Program, the GPS equipment may display a FAF waypoint not depicted on the approach chart. Procedures without a FAF and without a stepdown fix have a sensor FAF waypoint coded in the database. This sensor FAF waypoint is at least 4nm to the MAP waypoint. In this case, the MAP waypoint is always located at the navaid facility. If a stepdown fix exists on the published procedure that is greater than 2nm to the MAP, the stepdown fix becomes the sensor FAF waypoint. If a stepdown fix is 2nm or less to the MAP, a sensor FAF waypoint is established 4nm to the MAP. The sensor FAF is necessary to transition the display sensitivity on the GPS equipment from terminal to approach sensitivity. During communications with ATC, the pilot should make position reports based on charted positions, not the display on the GPS equipment, since the controller does not have access to this information. Examples of these situations are shown in the sample charts in Appendix 1.

(2) Final Approach Waypoint — GPS Stand Alone Approach. The final approach waypoint for a GPS stand alone approach will be a standard named waypoint normally located five nautical miles from the runway end.

(3) Course Sensitivity. The Course Deviation Indicator (CDI) sensitivity related to GPS equipment varies with the mode of operation. In the en route phase, prior to the execution of the instrument approach, the display sensitivity full scale deflection is 5nm either side of centerline.

(i) Upon activation of the approach mode, the display sensitivity transitions from a full scale deflection of 5nm to 1nm either side of centerline.

(ii) At a distance of 2nm inbound to the FAF waypoint, the display sensitivity begins to transition to a full scale deflection of 0.3 nautical miles either side of centerline. Some GPS avionics may provide an angular display between the FAF and MAP that approximates the course sensitivity of the localizer portion of an ILS.

(iii) When navigation to the missed approach holding point is activated, the display sensitivity transitions to provide a full scale deflection of one nautical mile either side of centerline.

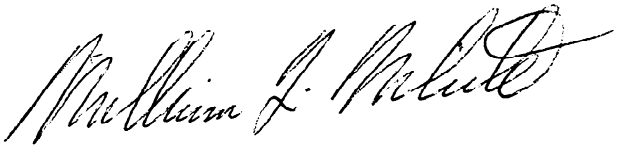
(4) Stepdown Fixes. A stepdown fix is flown in the same manner as a ground-based approach. Stepdown fixes on overlay approaches will not be identified with a waypoint unless it is named by the FAA. An unnamed stedown fix will not appear in the database sequence of waypoints. Pilots should be aware that the distance readout in the GPS display equates to the *distance-to-go to the active waypoint.* If the stepdown fix has not been assigned a waypoint name in the database (for overlay approach stepdown fixes), the distance-to-go readout may not correspond to the DME distance of the stepdown fix shown on the published approach chart. The pilot should monitor the along track distance (ATD) to the MAP to identify the stepdown fix. For stand alone GPS procedures, any required stepdown fixes prior to the missed approach waypoint will be identified by along track distances.

Note: *An approach fix identified by a DME will not be displayed on the GPS receiver unless there is a published name assigned to the DME fix. If the fix is not assigned a waypoint name, the distance-to-go (ATD) displayed on the GPS receiver may not agree with the approach chart DME reference distance.*

f. Missed Approach Segment. The following are some of the unique characteristics a pilot should be aware of during the missed approach segment of a nonprecision GPS approach.

(1) Missed Approach Point (MAP). The MAP waypoint on an overlay approach may be located at the runway threshold, the underlying facility, or at a specified distance from the runway or facility. There may be a difference between the along track countdown to the waypoint in the GPS equipment and the DME distance from a facility shown on the chart. Pilots need to take into account any differences when interpreting the distance shown in the GPS display against the charted values.

(2) Manual Activation of Missed Approach Function. After passing the missed approach point, the GPS equipment will not automatically sequence to the missed approach holding waypoint. When initiating a missed approach the pilot, upon passing the MAP, should manually sequence the GPS equipment to the next active waypoint. This may not necessarily be a missed approach holding waypoint, but may be a turn waypoint en route to the missed approach holding waypoint. The missed approach should be flown as charted using the same piloting techniques as a traditional missed approach.



William J. White
Deputy Director, Flight Standards Service

APPENDIX 1 — SAMPLE CHARTS

ROANOKE RAPIDS, NORTH CAROLINA, NDB or GPS RUNWAY 5
(Halifax County Airport)

After selecting the airport and approach information as outlined in the FAA Approved Flight Manual or Flight Manual Supplement, the waypoints will be automatically presented in the proper order to fly the approach. Pilots must arm (enable) approach mode prior to the IAF. This approach is considered a Phase III GPS Approach Overlay since "or GPS" appears in the title. The feeder routes from the Lawrenceville VORTAC, GUMBE Intersection, Tar River VORTAC, and DUFFI Intersection are outside the IAF. These routes are not required in the approach procedure sequence of waypoints. ***Note:*** *Some manufacturers may include feeder route information.*

Notice that this approach does not have an FAF. For the final sensitivity reduction to take place however (a requirement for a GPS overlay approach), an FAF waypoint must be established. For this approach, the database and GPS display includes a "sensor FAF," which is located at the default distance of 4nm to the MAP for Runway 05. It is identified in the database as FF05 (Final Approach Fix for Runway 05), but may not appear on the approach chart.

At the IAF (RZZ), the GPS equipment automatically sequences to the next waypoint, in this case the sensor FAF (FF05). After passing the IAF and prior to reaching the sensor FAF, the receiver is put on hold either by the pilot or automatically by the equipment depending on the manufacturer. TO-FROM navigation and an along track distance are provided in relation to the active waypoint, which in this case, is still the FAF. The procedure turn should be completed beyond the sensor FAF to ensure that the waypoint sequencing is properly achieved and that the receiver sensitivity is correctly activated. The procedure turn also should be completed within the protected airspace for the approach. In this case, withn 10nm from RAPIDS.

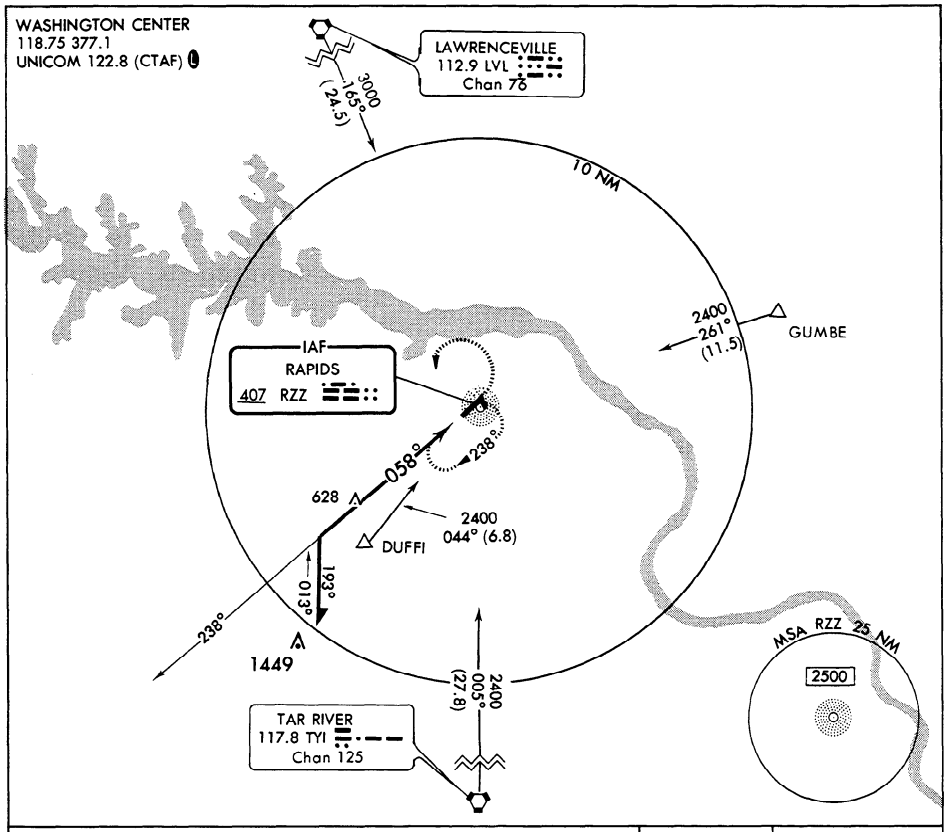
On the outbound leg of the procedure turn, set the final approach course (058°) on the OBS. When the inbound course is intercepted, the receiver is returned to automatic sequencing either by the pilot or automatically by the equipment depending on the manufacturer. TO-TO navigation and an along track distance are provided to the sensor FAF (FF05). At 2nm from the sensor FAF, the display sensitivity begins to transition to .3nm either side of centerline. At the sensor FAF, the GPS equipment automatically sequences to the MAP waypoint (RZZ) with an along track distance provided to the MAP.

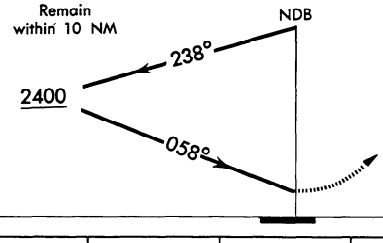
At the MAP, the GPS equipment must be manually sequenced to the next active waypoint. Once selected, the navigation equipment will display the missed approach holding point (RZZ). Display sensitivity full scale deflection changes to one nautical mile. The missed approach procedure is flown as depicted on the chart using normal piloting techniques; in this case, a climbing left turn to 2,400 feet and entry into a holding pattern at the RZZ waypoint. DIRECT-TO navigation is used to RZZ. After passing RZZ and while entering missed approach holding, the receiver is put on "hold" for the missed approach holding pattern.

Amdt 3 94118

NDB or GPS RWY 5

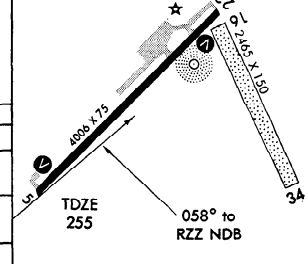
ROANOKE RAPIDS/HALIFAX COUNTY (RZZ)
AL-6379 (FAA)
ROANOKE RAPIDS, NORTH CAROLINA





MISSED APPROACH
Climbing left turn to 2400 into RZZ NDB holding pattern.

ELEV 256



CATEGORY	A	B	C	D
S-5	980-1 725 (800-1)		980-2 725 (800-2)	980-2¼ 725 (800-2¼)
CIRCLING	980-1 725 (800-1)		980-2 725 (800-2)	980-2¼ 725 (800-2¼)

Obtain local altimeter setting on CTAF; When not available use Rocky Mount altimeter setting and increase all MDAs 160 feet. When Rocky Mount altimeter setting not available, procedure not authorized.

△ NA

MIRL Rwy 5-23
REIL Rwys 5 and 23 (L)

Knots	60	90	120	150	180
Min:Sec					

NDB or GPS RWY 5

36°26'N – 77°43'W
ROANOKE RAPIDS, NORTH CAROLINA
ROANOKE RAPIDS/HALIFAX COUNTY (RZZ)

PROVIDENCE, RHODE ISLAND, VOR RUNWAY 5
(Green State Airport)

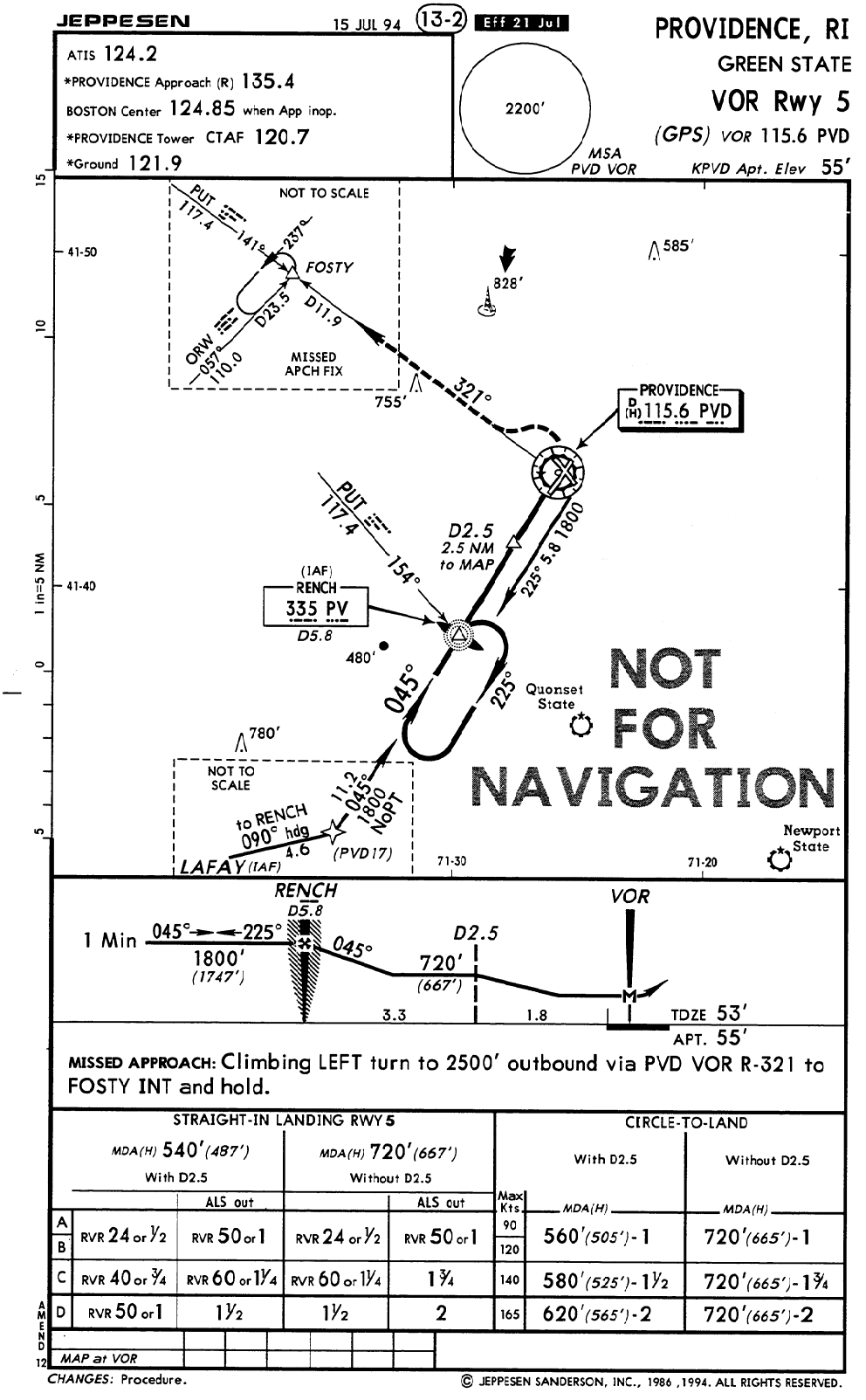
After selecting the airport and approach information as outlined in the FAA Approved Flight Manual or Flight Manual Supplement, the waypoints will be automatically presented in the proper order to fly the approach. Pilots must arm (enable) approach mode prior to the IAF. Since the words "or GPS" are not included in the title of the published approach procedure chart, it may be considered a Phase II GPS Overlay Approach procedure. This chart includes the database identifiers and waypoints for the GPS Overlay Approach.

This approach can be initiated from one of two Initial Approach Fix waypoints: LAFAY or RENCH. The waypoint sequence if the approach is started from LAFAY is LAFAY (IAF), the turn point in the initial segment (identified by the database code PVD17), RENCH (FAF), Providence VOR (MAP), and FOSTY (MAHP). The first portion of the route is flown to a turn point waypoint. Course guidance and an along track distance is provided to the turn waypoint (PVD17) to intercept the 045° inbound course to RENCH. After passing PVD17 and intercepting the inbound course, the along track distance to RENCH can be used to determine the distance remaining to the FAF.

If the approach is initiated from over RENCH, the waypoint sequence is RENCH (IAF/FAF), Providence VOR (MAP), and FOSTY (MAHP). The LOM serves as the IAF and the FAF. Prior to passing RENCH IAF outbound, the GPS receiver is put on hold to fly the course reversal. Depending on the manufacturer, this may be a pilot action or done automatically by the equipment. The course reversal is flown as charted with TO-FROM navigation provided in relation to the active waypoint, which in this case, is RENCH FAF. Once established on the inbound course, the receiver should be returned to automatic waypoint sequencing (TO-TO navigation). Depending on the manufacturer, this may be a pilot action or done automatically by the equipment. An along track distance is provided to RENCH FAF. At 2nm from RENCH FAF, the display sensitivity transitions to where full scale deflection is 0.3nm either side of centerline.

At the FAF, the waypoint automatically sequences to the MAP. An along track distance is provided to the MAP waypoint (PVD). Since the stepdown fix (D2.5) is not an FAA named fix, it is not included in the waypoint presentation; however, the point can be identified by an along track distance to PVD. When the ATD is 2.5nm to the MAP, the fix is identified. Note that on some approaches this distance may be different from the DME distance depicted in the profile view. In such cases, the along track distance at the bottom of the profile view can be used to monitor the distance readout.

At the MAP waypoint, the receiver automatically changes to manual operation and the pilot must manually sequence to the next active waypoint. Once complete, display sensitivity changes to full scale deflection of one nautical mile, and the missed approach holding point is displayed as the next waypoint. The first part of the missed approach procedure is flown as depicted on the chart: climbing left turn to 2,500 feet. Normal piloting techniques are used to intercept a 321° course (a TO-TO bearing of 321°) to FOSTY.


JEPPESEN
15 JUL 94
13-2
Eff 21 Jul
ATIS 124.2
*PROVIDENCE Approach (R) 135.4
BOSTON Center 124.85 when App inop.
*PROVIDENCE Tower CTAF 120.7
*Ground 121.9
2200'
MSA
PVD VOR
PROVIDENCE, RI
GREEN STATE
VOR Rwy 5
(GPS) VOR 115.6 PVD
KPVD Apt. Elev 55'
NOT TO SCALE
PUT 117.4
141°
237°
FOSTY
D23.5
D11.9
ORW 057° 110.0
MISSED APCH FIX
755'
321°
828'
585'
PROVIDENCE
(H) 115.6 PVD
PUT 117.4
154°
D2.5
2.5 NM to MAP
225° 5.8 1800
(IAF)
RENCH
335 PV
D5.8
480'
045°
225°
Quonset State
780'
NOT TO SCALE
to RENCH
090° hdg
4.6
11.2
045°
1800
NoPT
(PVD17)
LAFAY (IAF)
NOT FOR NAVIGATION
Newport State
41-50
41-40
71-30
71-20
1 in=5 NM
RENCH
D5.8
VOR
1 Min
045°
225°
1800'
(1747')
045°
D2.5
720'
(667')
3.3
1.8
TDZE 53'
APT. 55'
MISSED APPROACH: Climbing LEFT turn to 2500' outbound via PVD VOR R-321 to FOSTY INT and hold.
STRAIGHT-IN LANDING RWY 5
MDA(H) 540'(487') With D2.5
MDA(H) 720'(667') Without D2.5
ALS out
CIRCLE-TO-LAND
With D2.5
Without D2.5
Max Kts
MDA(H)
A
B
RVR 24 or 1/2
RVR 50 or 1
RVR 24 or 1/2
RVR 50 or 1
90
120
560'(505')-1
720'(665')-1
C
RVR 40 or 3/4
RVR 60 or 1 1/4
RVR 60 or 1 1/4
1 3/4
140
580'(525')-1 1/2
720'(665')-1 3/4
D
RVR 50 or 1
1 1/2
1 1/2
2
165
620'(565')-2
720'(665')-2
AMENDED 12
MAP at VOR
CHANGES: Procedure.
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LAKE CHARLES, LOUISIANA, VOR DME-B
(Lake Charles Regional Airport)

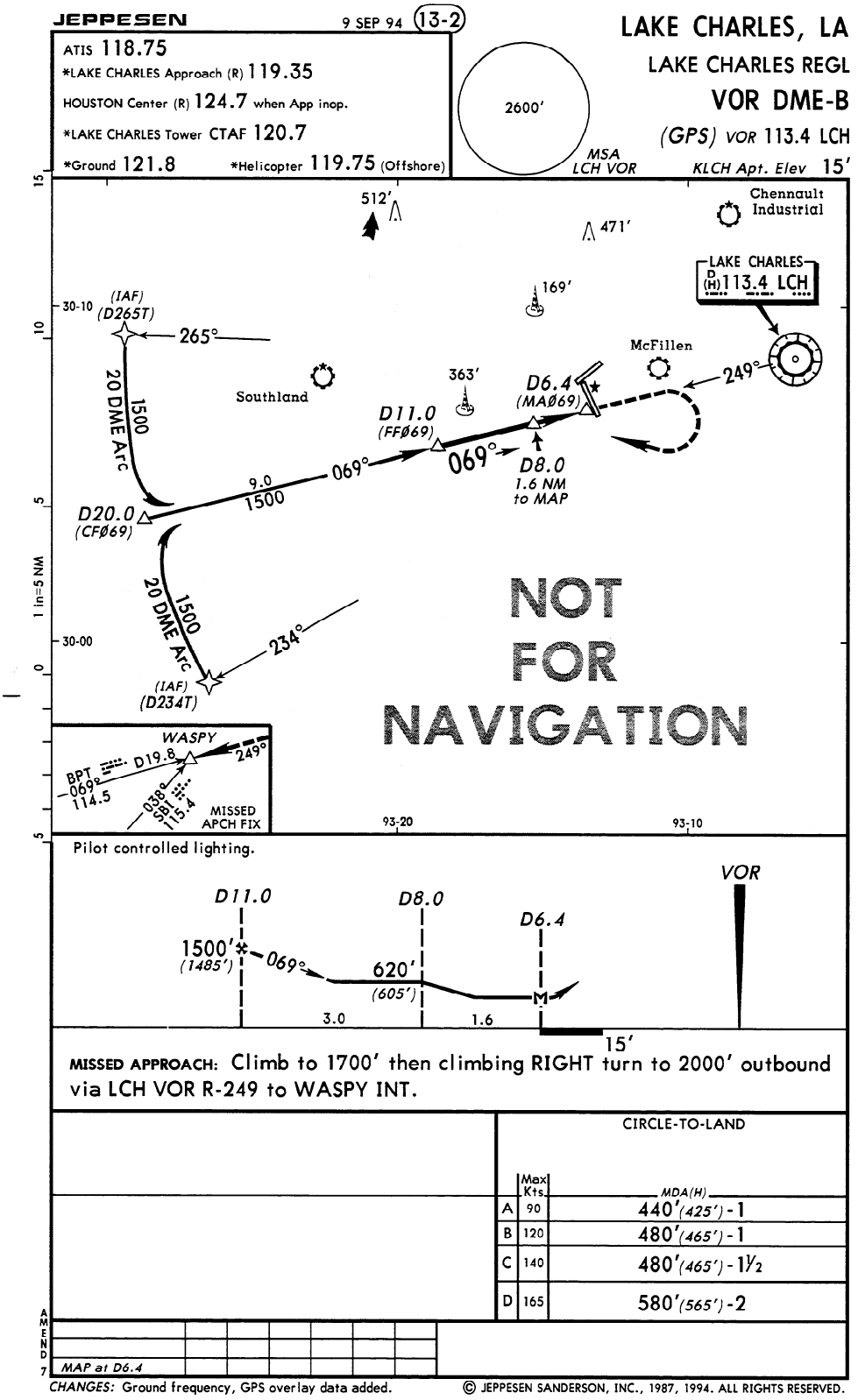
After selecting the airport and approach information as outlined in the FAA Approved Flight Manual or Flight Manual Supplement, the waypoints will be automatically presented in the proper order to fly the approach. Pilots must arm (enable) approach mode prior to the IAF. This example represents a Phase II GPS Overlay Approach.

This approach can be initiated from one of two Initial Approach Fix waypoints. These IAF waypoints are along the 20nm arc at points defined by the 234 and 265 degree radials from LCH. The IAF at R-234 will likely appear in the database as D234T. D234T represents a point located on the 234 degree radial of the Lake Charles VORTAC at 20nm. The letter T is the twentieth letter of the alphabet and is used to indicate a distance of 20nm. In addition, a waypoint is coded in the database at the intersection of the arc and final approach course (CF069). The approach waypoint sequence in this case is D234T (IAF), CF069, FF069 (FAF), MA069 (MAP), WASPY. The same sequence is provided for the other arc, except that it starts at D265T. The display in the receiver and procedure for flying the arc may vary with the manufacturer. Pilots should consult the FAA Approved Flight Manual, or Flight Manual Supplement for further details.

From either IAF normal piloting techniques are used to maintain the ground track of the arc enroute to the waypoint located at the intersection of the arc and the final approach course (CF069). From here the GPS equipment will sequence to the FAF (FF069). At 2nm from the FAF, the display sensitivity begins transitioning to where full scale deflection is .3nm either side of centerline.

At the FAF, the waypoint automatically sequences to the MAP (MA069). An along track distance is provided to the MAP wayoint. Since the stepdown fix (D8.0) is not an FAA named fix, it is not included in the waypoint presentation; however, the point can be identified by an along track distance to MA069. When the ATD is 1.6nm to the the MAP, the fix is identified. Note that on this approach there is a difference between the DME distance depicted in the profile view and the along track distance. In such cases, the along track distance at the bottom of the profile view can be used to monitor the GPS distance readout.

At the MAP waypoint, the receiver automatically changes to manual operation and the pilot must sequence the receiver to the next active waypoint. Once complete, the missed approach waypoint (WASPY) is displayed as the next wayoint. The first part of the missed approach procedure is flown as depicted on the chart: Climb to 1,700 feet, then climbing right turn to 2,000 feet outbound via LCH VOR R-249 to WASPY. Normal piloting techniques are used to intercept a 249° course (a TO-TO bearing of 249°) to WASPY. Display sensitivity begins to change to a full scale deflection of one nautical mile either side of centerline once WASPY is sequenced.


JEPPESEN
9 SEP 94
13-2
ATIS 118.75
*LAKE CHARLES Approach (R) 119.35
HOUSTON Center (R) 124.7 when App inop.
*LAKE CHARLES Tower CTAF 120.7
*Ground 121.8
*Helicopter 119.75 (Offshore)
LAKE CHARLES, LA
LAKE CHARLES REGL
VOR DME-B
(GPS) VOR 113.4 LCH
KLCH Apt. Elev 15'
2600'
MSA
LCH VOR
512'
471'
Chennault Industrial
LAKE CHARLES
D (H) 113.4 LCH
169'
363'
Southland
McFillen
(IAF)
(D265T)
265°
20 DME Arc
1500
D20.0
(CFØ69)
9.0
1500
069°
D11.0
(FFØ69)
069°
D6.4
(MAØ69)
249°
D8.0
1.6 NM
to MAP
20 DME Arc
1500
234°
(IAF)
(D234T)
30-10
30-00
1 in=5 NM
NOT
FOR
NAVIGATION
WASPY
249°
D19.8
BPT
069°
114.5
038°
SBI
115.4
MISSED
APCH FIX
93-20
93-10
Pilot controlled lighting.
VOR
D11.0
D8.0
D6.4
1500'
(1485')
069°
620'
(605')
3.0
1.6
15'
MISSED APPROACH: Climb to 1700' then climbing RIGHT turn to 2000' outbound via LCH VOR R-249 to WASPY INT.
CIRCLE-TO-LAND
Max Kts
MDA(H)
A 90 440'(425')-1
B 120 480'(465')-1
C 140 480'(465')-1½
D 165 580'(565')-2
AMND 7
MAP at D6.4
CHANGES: Ground frequency, GPS overlay data added.
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OSHKOSH, WISCONSIN, GPS RUNWAY 27
(Wittman Regional Airport)

After selecting the airport and approach information as outlined in the FAA Approved Flight Manual or Flight Manual Supplement, the waypoints will be automatically presented in the proper order to fly the approach. Pilots must arm (enable) approach mode prior to the IAF. This stand alone GPS approach can be initiated from one of four Initial Approach Fix waypoints: PEENA, FLOUN, AMAZE, or the Falls VOR.

If the approach is started from either FLOUN, AMAZE, or the Falls VOR, the waypoint sequence would be the appropriate IAF, PRIMO, PEENA (FAF), HNSON (MAP), and GRATE (MAHP). After passing the appropriate IAF, course guidance (TO-TO navigation) and an along track distance is provided to the IF waypoint (PRIMO). Once the inbound course is intercepted, the along track distance to PEENA can be used to determine the distance remaining to the FAF.

If the approach is initiated from over PEENA, the waypoint sequence is PEENA (IAF/FAF), HNSON (MAP), and GRATE (MAHP). PEENA serves as the IAF and FAF. Prior to passing PEENA (IAF) outbound, the GPS receiver is put on hold to fly the course reversal. Depending on the manufacturer, this may be a pilot action or done automatically by the equipment. The course reversal is flown as charted with TO-FROM navigation provided in relation to the active waypoint, which in this case, is PEENA FAF. Once established on the inbound course, the receiver must be returned to automatic waypoint sequencing (TO-TO navigation). Depending on the manufacturer, this may be a pilot action or done automatically by the equipment. An along track distance is provided to PEENA FAF.

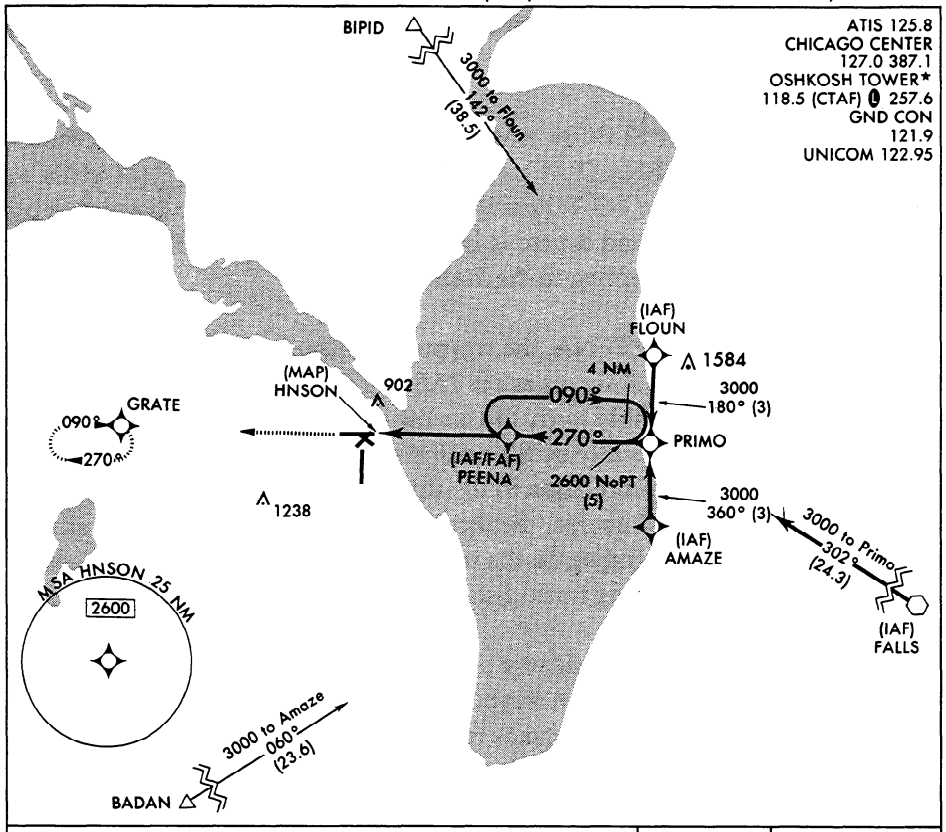
At 2nm from PEENA FAF, the display sensitivity begins transitioning to where full scale deflection is .3nm either side of centerline. At the FAF the waypoint automatically sequences to the MAP (HNSON) and the along track distance will show the distance remaining to the MAP.

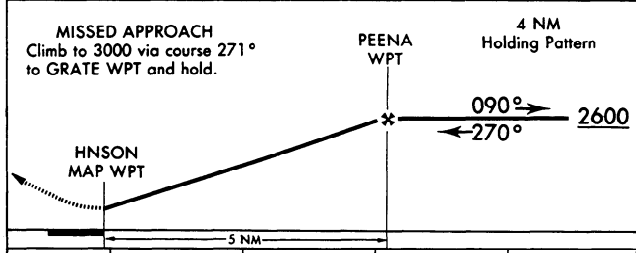
At HNSON the receiver automatically changes to manual operation and the pilot should manually sequence to the next active waypoint. Once complete, the missed approach holding point (GRATE) is displayed. Normal piloting techniques are used to climb to 3,000 feet and intercept a 271° course (a TO-TO bearing of 271°) to GRATE. Upon sequencing to GRATE the display sensitivity begins to change to a full scale deflection of one nautical mile.

Orig 94286

GPS RWY 27

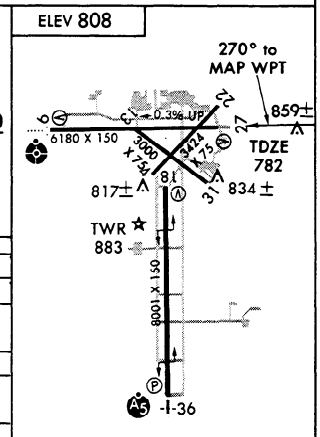
OSHKOSH/WITTMAN REGIONAL (OSH)
OSHKOSH, WISCONSIN





CATEGORY	A	B	C	D
S-27	1120-1 338 (400-1)			
CIRCLING	1260-1 452 (500-1)		1260-1½ 452 (500-1½)	1360-2 552 (600-2)
GREEN BAY ALTIMETER SETTING MINIMUMS				
S-27	1220-1 438 (500-1)		1220-1¼ 438 (500-1¼)	1220-1½ 438 (500-1½)
CIRCLING	1360-1 552 (600-1)		1360-1½ 552 (600-1½)	1480-2¼ 672 (700-2¼)

When control tower closed, except for operators with approved weather reporting service, use Green Bay altimeter setting.
△ NA



REIL Rwys 18 and 27
HIRL Rwys 9-27 and 18-36

GPS RWY 27

Orig 94286

43°59'N–88°33'W

OSHKOSH, WISCONSIN
OSHKOSH/WITTMAN REGIONAL (OSH)

APPENDIX 2 — GLOSSARY

Active Waypoint — The waypoint to/from which the navigational guidance is being provided.

Along Track Distance (ATD) Fix — A distance in nautical miles (NM) to the active waypoint along the specified track. An ATD fix will not be used where a course change is made.

Course Set — Guidance set from information provided by the GPS equipment that assists the pilot in navigating to or from an active waypoint on a heading/bearing.

Data Agency — An agency, public or private, other than a publisher of government source documents, who compiles official document information into charts or electronic formats for cockpit use.

Dead Reckoning (DR) — The navigation of an airplane solely by means of computations based on airspeed, course, heading, wind direction and speed, ground speed, and elapsed time.

Direct To — A method used with the GPS equipment to provide the necessary course from present position directly to a selected waypoint. This is not the *course* waypoint to waypoint.

En Route Domestic — The phase of flight between departure and arrival terminal phases, with departure and arrival points within the U.S. National Airspace System (NAS).

En Route Oceanic — The phase of flight between the departure and arrival terminal phases, with an extended flight route over the high seas.

En Route Operations — The phase of navigation covering operations between departure and arrival terminal phases. The en route phase of navigation has two subcategories: en route domestic and en route oceanic.

Fly By Waypoint — An waypoint that permits turn anticipation and does not require the aircraft to pass directly over it.

Fly Over Waypoint — A waypoint that requires the aircraft to pass directly over it.

Geodetic Datum — The numerical or geometrical quantity or set of such quantities (mathematical model) which serves as a reference for computing other quantities in a specific geographic region such as the latitude and longitude of a point.

Global Navigation Satellite Systems (GNSS) — An "umbrella" term adopted by the International Civil Aviation Organization (ICAO) to encompass any independent satellite navigation system used by a pilot to perform onboard position determinations from the satellite data.

Global Positioning System (GPS) — A U.S. space-based positioning, velocity, and time system composed of space, control, and user elements. The space element, when fully operational, will be composed of 24 satellites in six orbital planes. The control element consists of five monitor stations, three ground antennas and a master control station. The user element consists of antennas and receiver-processors that provide positioning, velocity, and precise timing to the user.

Instrument Approach Waypoints — Geographical positions, specified in latitude/longitude used in defining GPS instrument approach procedures, including the initial approach waypoint, the intermediate waypoint, the final approach waypoint, the missed approach waypoint, and the missed approach holding waypoint.

Integrity — The probability that the system will provide accurate navigation as specified, or timely warnings to users when GPS data should not be used for navigation.

National Airspace System (NAS) — The common network of U.S. airspace; air navigation facilities, equipment and services, airport or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material. Included are system components shared jointly with the military.

Nonprecision Approach Operations — Those flight phases conducted on charted Standard Instrument Approach Procedures (SIAPs) commencing at the initial approach fix and concluding at the missed approach point or the missed approach holding point, as appropriate.

Oceanic Airspace — Airspace over the oceans of the world, considered international airspace, where oceanic separation and procedures per the International Civil Aviation Organization (ICAO) are applied. Responsibility for the provisions of air traffic control service in this airspace is delegated to various countries, based generally upon geographic proximity and the availability of the required resources.

Pseudo-Range — The determination of position, or the obtaining of information relating to position, for the purposes of navigation by means of the propagation properties of radio waves. The distance from the user to a satellite plus an unknown user clock offset distance. With four satellite signals it is possible to compute position and clock offset distance.

Receiver Autonomous Integrity Monitoring (RAIM) — A technique whereby a civil GPS receiver/processor determines the integrity of the GPS navigation signals using only GPS signals or GPS signals augmented with altitude. This determination is achieved by a consistency check among redundant pseudo-range measurements. At least one satellite in addition to those required for navigation must be in view for the receiver to perform the RAIM function.

Secondary Sensor — Any input from other aircraft systems that may be used to derive navigation information.

Selective Availability (SA) — A method by which the Dept. of Defense can artificially create a significant time and positioning error in the satellites. This feature is designed to deny an enemy the use of precise GPS positioning data.

Sensor FAF — A final approach waypoint created and added to the database sequence of waypoints to support GPS navigation of an FAA published, no-FAF, nonprecision instrument approach procedure.

Supplemental Air Navigation System — An approved navigation system that can be used in conjunction with, or in addition to, a primary air navigation system. May be used as the sole navigation system provided an operational approved alternate (primary) navigation system, suitable for the route of flight, is installed on the aircraft.

Terminal Area Operations — Those flight phases conducted on charted Standard Instrument Departures (SIDs), on Standard Terminal Arrival Routes (STARs), or other flight operations between the last en route fix/waypoint and the initial approach fix/waypoint.

TO-FROM Navigation — RNAV equipment in which the desired path over the ground is defined as a specific (input quantity) course emanating either to or from a particular waypoint. The equipment functions like a conventional VOR receiver where the CDI needle and the "to/from" indicator responds to movement of the OBS. In this equipment, the aircraft may fly either TO or FROM any single designated waypoint.

TO-TO Navigation — RNAV equipment in which a path is computed that connects two waypoints. In this equipment, two waypoints must always be available, and the aircraft is usually flying between the two waypoints and TO the active waypoint. In this equipment the CDI needle functions like its tracking a localizer signal; that is movement of the OBS has no effect on the CDI needle or the "to/from" indicator.

Turn Anticipation — The capability of RNAV systems to determine the point along a course, prior to a turn waypoint, where a turn should be initiated to provide a smooth path to intercept the succeeding course within the protected airspace, and to enunciate the information to the pilot.

User-selectable Navigation Database — A navigation database having user-defined contents accessible by the pilot and/or the navigation computer during aircraft operations in support of navigation needs. This database is stored electronically and is typically updated at regular intervals, such as the AIRAC 28-day cycle. It does not include data that can be entered manually by the pilot or operator.

Waypoint (WP) — A predetermined geographical position used for route definition and/or progress reporting purposes that is defined by latitude/longitude.

World Geodetic System (WGS) — A consistent set of parameters describing the size and shape of the earth, the positions of a network of points with respect to the center of mass of the earth, transformations from major geodetic datums, and the potential of the earth (usually in terms of harmonic coefficients).

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